REMARKS

Applicants initially note that their information disclosure statement dated 3 August 2001 has been considered by the Office. However, three additional information disclosure statements dated 22 August 2001, 27 November 2001, and 3 July 2002 have been likewise been submitted to the Office. Consideration of the additional references disclosed by Applicants in these information disclosure statements is requested.

Applicants also note that the specification is still objected to as it was in the Office action dated 29 January 2002 on grounds that the status of the related applications should be updated. Such status was updated in Applicants' Amendment and Response dated 25 April 2002. Withdrawal of the objection is respectfully requested.

Explanation of Amendments:

Claim 21 is amended to clarify the conductive nature of the hard particles and the position of the particles with respect to the electrical contact sites.

Claim 22 is amended to clarify the relationship of the additional element (the nickel plating layer) added by the claim to the elements previously set forth in claim 21. The scope of the claim remains unchanged by this amendment.

Claim 23 is amended to ensure appropriate antecedent basis to claim 21 as amended.

Claim 26 is amended to clarify the relationship of the additional element (the metal plating layer) added by the claim to the elements previously set forth in claim 23. The scope of the claim remains unchanged by this amendment.

Claim 28 is amended to only include those hard particle cores that are themselves not conductive and its dependency is changed to new claim 95. The nickel-coated diamond embodiment is now set forth in claim 96.

Claim 48 is amended to clarify the conductive nature of the hard particles and the position of the particles with respect to the electrical contact sites.

Claim 51 is amended to clarify the relationship of the additional element (the metal plating layer) added by the claim to the elements previously set forth in claim 48. The scope of the claim remains unchanged by this amendment.

New claims 93-100 further define alternative embodiments of pending original claims 21, 22, 26, 48 and 51 as disclosed in the specification.

Indefiniteness Rejections - 35 U.S.C. § 112

Claim 27 is rejected in the Office action under 35 U.S.C. § 112, second paragraph, for indefiniteness. Claim 27 is canceled herein and therefore this rejection is moot.

Novelty Rejections - 35 U.S.C. § 102(b)

Claims 21-25, 28, and 48-50 are again rejected in the Office action under 35 U.S.C. § 102(b) as anticipated by Zimmer, U.S. Patent No. 5,921,856. It appears that the rejection is repeated verbatim from the Office action dated 29 January 2002. Applicants fully responded to and traversed these rejections in the Amendment and Response dated 25 April 2002. There is no indication in the present Office action that such arguments were considered by the Office as the action merely states that Applicants prior arguments are moot in light of the new grounds for rejection, when in fact Zimmer is not a new ground. Applicants reiterate their response of 25 April 2002 and maintain the position that Zimmer in no way anticipates any of the claims of the present application. Withdrawal of the rejections based upon Zimmer is again requested.

Novelty Rejections - 35 U.S.C. § 102(e)

Claims 21-28, and 48-51 are rejected in the Office action under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,410,415 B1 to Estes et al. Applicants note that claim 27 is canceled herein; therefore the rejection with respect to this claim is moot. Applicants believe the contentions of the Office with respect to the remaining claims in view of Estes et al. are mistaken in several regards.

First, referenced element 8 in Figure 6 of Estes et al. is characterized by the Office as "a plurality of hard particles." In fact, reference element 8 actually identifies "polymer bumps" of "electrically conductive paste" composed of a resin filled with electrically conductive metal flakes. See col. 5, ll. 5-8 and 38-47. As noted in the Office action, Estes et al. further describes the addition of hard, abrasive particles to the electrically conductive resin of polymer bumps, which particles are homogeneously mixed therein. See col. 7, ll. 8-19. However, the hard particles in the polymer bumps are suspended in a polymer resin. This is an entirely different structure than that of the present invention as claimed.

The particles of the present invention are not a polymer bump, nor are the hard particles suspended in an electrically conductive resin forming a bump. Electrically conductive hard particles are defined in the written description of the present application as either metal particles or nonconductive hard particle cores covered by a conductive metal layer. (See specification, p. 11, ll. 10-20.) Each electrically conductive hard particle is singular and is attached directly to an electric contact surface. Claims 21 and 48 define assemblies comprising, in part, particles affixed in "direct contact" with the conductive

surfaces of the electrical contact sites. The claimed structure of the present invention is different than and distinct from particles suspended in a polymer.

The principle behind the electrical connection bumps in Estes et al. is entirely different than that of the present invention. The electrically conductive hard particles of the present invention are not an electrically conductive polymer as disclosed in Estes et al. The electrically conductive polymer described by Estes et al. as providing the electrical interconnection between components and substrates is generally a polymer resin filled with metal powder or flakes allowing current to flow throughout the polymer. In contrast, the singular electrically conductive hard particles of the present invention each, individually, conduct current (either because the particle itself is conductive, or the particle is coated with a conductive surface) from a first electrical contact to a second electrical contact. Electrical interaction directly between electrically conductive hard particles would only occur if two particles happened to touch each other. For at least these reasons, Applicants contend that the rejection of claims 21-26, 28, and 48-51 is improper and request issuance of a notice allowing the pending claims.

With regard to claims 22, 26, and 51, Estes et al. actually teaches away from these further embodiments of the present invention. The passage in Estes et al. cited in the Office action (col. 5, ll. 27-37) is merely a description of the common method of removing oxidation from bond pads and applying a good conducting layer, generally by plating a metal. The oxidation removal process described by Estes at al. in no way suggests affixing particles to the bond pads by plating. The particles in Estes et al. are suspended in a polymer resin that is later deposited on the bond pads as indicated above. In fact, Estes et al. states clearly: "the plating of the flip chip polymer bump surface with a hard material, rather than inclusion of hard particles in the flip chip bump, is not contemplated by the invention, as this alternative is found to be not effective. ... [T]he plating can compromise the electrical conductivity of the bump." See col. 7, ll. 66 – col. 8, ll. 9. This teaching is in stark contrast to the teaching of the present invention in which plating of the particles is key to providing electrical conductivity in the connection between the electrical contact sites on the substrate and any component that may be attached. For these additional reasons, Applicants request that the rejection of claims 22, 26, and 51 be rescinded and a notice allowing the pending claims be issued.

Claims 21-27, and 48-52 are further rejected in the Office action under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,404,476 B1 to Mase. Again, as claim 27 is canceled herein, the rejection with respect to this claim is moot. Applicants believe the

rejections of the remaining claims by the Office with respect to Mase are improper for the following reasons.

As a general matter, similar to the discussion with respect to Estes at al. above, the principle behind the electrical connection structure in Mase is entirely different than that of the present invention. The electrically conductive hard particles of the present invention are not part of an electrically conductive adhesive film as disclosed in Mase. Mase describes using an anisotropic conductive, adhesive film filled with polystyrene spheres plated with a gold film. See col. 4, ll. 18. As the film is described as a conductive adhesive, the necessary implication is that the gold-coated, polystyrene spheres fill the film and electrically interact with each other, thereby allowing current to flow throughout the adhesive film. (This description contravenes the depiction of the liquid crystal device of Mase shown in Figure 3, which shows only a single polystyrene sphere and a single, nonconductive hard particle. In view of the written description describing the adhesive film as conductive, Figure 3 can only be interpreted as showing a representative one of a large number of conductive polystyrene-gold particles distributed throughout the adhesive in order to electrically interact and create a conductive substance.) Again, in contrast, the singular electrically conductive hard particles of the present invention each, individually, may conduct current (either because the particle itself is conductive, or the particle is coated with a conductive surface) from a first electrical contact to a second electrical contact. Electrical interaction directly between electrically conductive hard particles would only occur if two particles happened to touch each other.

In particular, the conductive particles disclosed by Mase are resilient polystyrene particles coated with gold. These particles are not hard, and in fact are compressible and may be destroyed under pressure. The hard particles are described as SiO_2 spheres and are expressly not electrically conductive. The purpose of the hard particles is to prevent the destruction of the conductive polystyrene particles when under compression. Therefore, Mase does not disclose or teach the structure of electrically conductive hard particles affixed directly to the electrical contact sites of a substrate as claimed in the present application. As described in the present application, electrically conductive hard particles are chosen, at least in part, for the property of being able to withstand compressive forces and pierce opposing electrical contact surfaces. For at least these reasons, Applicants contend that the rejection of claims 21-26 and 48-52 is improper and request issuance of a notice allowing the pending claims.

Further, with respect to the rejection of claim 52, although Mase discusses a flexible circuit substrate, the teaching of its use is entirely different than that of the present invention. Mase describes using a "flexible print circuit" for electrical connection between substrates as an alternative to the embodiment in which the compressible polystyrene-gold spheres are used. See col. 5, l. 59 – col. 6, l. 6. Mase does not teach affixing electrically conductive hard particles to a flexible circuit substrate as claimed in the present application. For this additional reason, Applicants request withdrawal of the rejection to claim 52.

Obviousness Rejections - 35 U.S.C. § 103

The Office action rejects claims 53 and 54 as obvious in consideration of the following combinations of references: Estes et al. and U.S. Patent No. 5,913,110 to Herbst; Estes et al. and U.S. Patent No. 6,395,124 B1 to Oxman et al.; Mase and Herbst; and Mase and Oxman et al. In view of Applicants remarks above regarding the disclosures of Estes et al. and Mase, Applicant contends that the rejections under 35 U.S.C. § 103 are moot. Withdrawal of the rejections to claims 53 and 54 is therefore requested.

In addition, upon review of Oxman et al. Applicants do not believe the reference discloses the structures asserted in the Office action. Oxman et al. at the cited passage (col. 9, l. 65 – col. 10, l. 15) discusses the lamination of electrical components to substrates after the electrical components are soldered to the substrate. Oxman et al. further describes laminating substrates opaque to light of certain wavelengths and suggests that smart cards may have such substrate layers. Oxman et al. does not specifically disclose a smart card module substrate is and it further never discusses a smart label structure.

CONCLUSION

Applicants request entry of the amendments to claims as set forth herein and the inclusion and consideration of new claims 93-100. As the references cited by in the Office action do not individually anticipate or in combination render obvious any of the pending claims, Applicants request the withdrawal of the rejections to the pending claims and swift issuance all claims remaining in the application to patent.

Respectfully submitted this 30th day of October 2002.

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ATTACHMENT A

CLAIM AMENDMENTS - VERSION WITH MARKINGS TO SHOW CHANGES MADE

Additions are underlined and deletions are shown in ~~strikethrough~~.

21. (Amended) An electrical component assembly comprising:

a) a substrate having a plurality of electrical contact sites on a surface thereof; and

b) a plurality of electrically conductive hard particles positioned on the substrate, such that each of the electrical contact sites has at least one electrically conductive hard particle associated therewith, wherein the at least one electrically conductive hard ~~particles being~~ particle is affixed ~~to the~~ in direct contact with a conductive surface of its associated electrical contact ~~sites~~ site.

22. (Amended) An electrical component assembly as described in claim 21, ~~wherein the plurality of~~ further comprising a layer of nickel plated on each of the electrical contact sites, wherein the layer of nickel affixes the at least one electrically conductive hard ~~particles is affixed~~ particle to the conductive surface of its associated electrical contact site ~~sites by a layer of plated nickel~~.

23. (Amended) An electrical component assembly as described in claim 21 further comprising an non-conductive adhesive material applied to at least selected portions of the surface of the substrate and the plurality of electrically conductive hard particles.

26. (Amended) An electrical component assembly as described in claim 23, ~~wherein the plurality of~~ further comprising a thin layer of metal plated on each of the electrical contact sites, wherein the thin layer of metal affixes the at least one electrically conductive hard ~~particles is affixed~~ particle to the conductive surface of its associated electrical contact site ~~sites by plating a thin metal layer over the plurality of hard particles on the electrical contact sites~~.

28. (Amended) An electrical component assembly as described in claim ~~21~~ 95, wherein the nonconductive hard ~~particles are~~ particle core is selected from the group consisting of: diamond, ~~nickel-plated diamond,~~ garnet and silicon carbide.

48. (Amended) A printed circuit interconnection assembly comprising:

a printed circuit board substrate having a plurality of electrical contact sites on a surface thereof; and

a plurality of electrically conductive hard particles positioned on the substrate, such that each of the plurality of electrical contact sites has at least one electrically conductive hard particle associated therewith, wherein the at least one electrically conductive hard particle is affixed ~~to each~~ in direct contact with a conductive surface of its associated electrical contact site.

51. (Amended) A printed circuit interconnection assembly as described in claim 48, ~~wherein the plurality of hard particles~~ further ~~comprises a plated~~ comprising a thin metal layer plated on each of the electrical contact sites, wherein the thin metal layer ~~that~~ affixes the ~~plurality of~~ at least one electrically conductive hard ~~particles~~ particle to the conductive surface of its associated electrical contact ~~sites~~ site.

93. (New) An electrical component assembly as described in claim 22, wherein the at least one electrically conductive hard particle comprises a nonconductive hard particle core with an outer surface that is coated by the layer of nickel.

94. (New) An electrical component assembly as described in claim 26, wherein the at least one electrically conductive hard particle comprises a nonconductive hard particle core with an outer surface that is coated by the thin layer of metal.

95. (New) An electrical component assembly as described in claim 21, wherein each of the plurality of electrically conductive hard particles comprises a nonconductive hard particle core with an outer surface coated by a conductive material.

96. (New) An electrical component assembly as described in claim 21, wherein each of the plurality of electrically conductive hard particles comprises a diamond particle core with an outer surface coated by a layer of nickel.

97. (New) A printed circuit interconnection assembly as described in claim 51, wherein the at least one electrically conductive hard particle comprises a nonconductive hard particle core with an outer surface that is coated by the thin metal layer.

98. (New) A printed circuit interconnection assembly as described in claim 97, wherein the nonconductive hard particle core is comprised of diamond.

99. (New) A printed circuit interconnection assembly as described in claim 97, wherein the thin metal layer comprises a layer of nickel.

100. (New) A printed circuit interconnection assembly as described in claim 48, wherein each of the plurality of electrically conductive hard particles comprises a diamond particle core with an outer surface coated by a layer of nickel.